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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,782	08/31/2001	Irene Spitsberg	13DV13716	1039

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EXAMINER	
MARKHAM, WESLEY D	

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 07/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Advisory Action	Application No.	Applicant(s)	
	09/943,782	SPITSBERG ET AL.	
	Examiner	Art Unit	
	Wesley D Markham	1762	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 28 June 2004 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE. Therefore, further action by the applicant is required to avoid abandonment of this application. A proper reply to a final rejection under 37 CFR 1.113 may only be either: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114.

PERIOD FOR REPLY [check either a) or b)]

a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection. ONLY CHECK THIS BOX WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

1. ☐ A Notice of Appeal was filed on _____. Appellant's Brief must be filed within the period set forth in 37 CFR 1.192(a), or any extension thereof (37 CFR 1.191(d)), to avoid dismissal of the appeal.

2. ☐ The proposed amendment(s) will not be entered because:

   (a) ☐ they raise new issues that would require further consideration and/or search (see NOTE below);

   (b) ☐ they raise the issue of new matter (see Note below);

   (c) ☐ they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

   (d) ☐ they present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____.

3. ☒ Applicant's reply has overcome the following rejection(s): The 35 U.S.C. 112, second paragraph, rejection of Claim 23.

4. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

5. ☐ The a)☐ affidavit, b)☐ exhibit, or c)☐ request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.

6. ☐ The affidavit or exhibit will NOT be considered because it is not directed SOLELY to issues which were newly raised by the Examiner in the final rejection.

7. ☒ For purposes of Appeal, the proposed amendment(s) a)☐ will not be entered or b)☒ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.

   The status of the claim(s) is (or will be) as follows:

   Claim(s) allowed: _____.

   Claim(s) objected to: _____.

   Claim(s) rejected: *1-3 and 5-23*.

   Claim(s) withdrawn from consideration: _____.

8. ☐ The drawing correction filed on _____ is a)☐ approved or b)☐ disapproved by the Examiner.

9. ☐ Note the attached Information Disclosure Statement(s)(PTO-1449) Paper No(s). _____.

10. ☒ Other: *see attached Office Action*

WDM

DETAILED ACTION / ADVISORY ACTION

Response to Amendment

1. Acknowledgement is made of the after-final amendment filed by the applicant on 6/28/2004, in which the applicant proposed to amend Claims 21 and 23 to clarify an antecedent basis issue and correct a typographical error, respectively. This amendment has been entered. As such, the 35 U.S.C. 112, second paragraph, rejection of Claim 23, set forth in paragraph 5 of the previous Office Action (i.e., the final Office Action mailed on 4/2/2004), is withdrawn. **Claims 1 – 3 and 5 – 23** remain pending in U.S. Application Serial No. 09/943,782, and an advisory action follows.

Response to Arguments

2. Applicant's arguments filed on 6/28/2004 have been fully considered but they are not persuasive.
3. Regarding the 35 U.S.C. 102 rejection based on Schaeffer et al., the applicant argues that Schaeffer et al. does not disclose a TBC comprising YSZ having a yttria content of from about 3 percent by weight to about 5 percent by weight of the YSZ. In response, the examiner disagrees with this assertion. Schaeffer et al. teaches YSZ having a yttria content of, for example, 4 to 20 wt% (Col.3, lines 53 – 56). The endpoint of this range taught by Schaeffer et al. is 4 wt%, which is a value squarely within the applicant's claimed range. Please note that a specific example in the prior art which is within a claimed range anticipates the range (MPEP 2131.03).

Additionally, the range of Schaeffer et al., at the very least, overlaps the applicant's claimed range. Prior art which teaches a range overlapping the claimed range anticipates if the prior art range discloses the claimed range with sufficient specificity (MPEP 2131.03). In this case, the endpoint of the prior art range taught by Schaeffer et al. falls squarely in the middle of the applicant's claimed range, and half of the applicant's entire claimed range is encompassed by the range taught by Schaeffer et al. As such, the range of Schaeffer et al. discloses the claimed range with "sufficient specificity", thereby anticipating the claimed range.

4. Regarding the 35 U.S.C. 103(a) rejections based on Schaeffer et al., the applicant attempts to rebut the *prima facie* case of obviousness by showing criticality of the claimed oxygen partial pressure range. In the attempt to show criticality, the applicant cites paragraphs [0024] and [0025] of the specification of the instant application. After reviewing the cited portions of the specification and the specification as a whole, the examiner disagrees with the applicant's assertion that the claimed range is "critical" or leads to "unexpected experimental results", especially when taken in view of the disclosure of Schaeffer et al. For example, paragraphs [0025] states, in part, that if the pre-oxidation parameters lie outside the appropriate ranges, an alumina scale will be produced, but it will be less desirable than the alumina scale produced by pre-oxidation within the ranges. The fact that a certain portion of a range leads to more desirable results and another portion of a range leads to less desirable results, in and of itself, is not sufficient to establish unexpected results or that the range is critical. The examiner expands on this

statement by noting the following. Schaeffer et al. teaches a broad range of pressure values (i.e., an oxygen partial pressure of greater than about 10^{-30} mbar) sufficient to oxidize the bond coat. No one of ordinary skill in the art would reasonably expect all the oxidation partial pressure values in the range taught by Schaeffer et al. to function in oxidizing the bond coat in exactly the same manner and equally well. As such, one of ordinary skill in the art would have been expected to utilize the portion of the range disclosed by Schaeffer et al. that provides the most beneficial results. It is worthy to note that the applicant's claims recite a large range of oxygen partial pressure values (i.e., about 10^{-5} to about 10^{3} mbar) that falls squarely within the range disclosed by Schaeffer et al. The fact that a middle portion of the range of pressure values taught by Schaeffer et al. (e.g., the range claimed by the applicant) functions to give more desirable results than the outer portions of the range is not unexpected, but rather, expected. Additionally, the applicant's statement in paragraph [0025] of the specification that, "Non-uniform microstructures resulted when the pre-oxidation pressure was greater than about 10^{-4} mbar" contradicts the applicant's assertion of the criticality of the claimed range, which is, "from about 10^{-5} mbar to about 10^{3} mbar". From this statement, it is seen that the majority of the claimed range of pre-oxidation pressures falls within a range that is disclosed by the applicant to lead to non-uniform microstructures. This is clear evidence that the claimed range is not "critical" and does not provide "unexpected results". The applicant's argument that, "a non-uniform microstructure may still be superior to the microstructure in the lower-pressure range" appears to be supposition on the part of

the applicant and is not supported by art or evidence of record. Additionally and importantly, the allegedly "critical" pre-oxidation parameters of the applicant are selected so as to achieve a desired alpha alumina microstructure (see paragraph [0025]). However, Schaeffer et al. also goes to great lengths to insure that the alumina formed on the bond coat by the pre-oxidation process is mature alpha alumina without other undesirable crystal structures (Col.4, lines 55 – 67, and Col.5, lines 1 – 48). As such, the beneficial results obtained by the applicant (i.e., obtaining a desired alpha alumina microstructure) due to the use of specific oxidation conditions (e.g., partial pressure) are also obtained by Schaeffer et al.'s pre-oxidation of the bond coat under "specified conditions" (Col.5, lines 4 – 8).

5. The applicant also argues that Schaeffer teaches a range of yttria of 4 – 20 percent, and then preferred ranges of 6 – 20 percent and 6 – 10 percent, which preferred ranges teach away from the present approach. This argument is not persuasive because, regardless of the preferred embodiments of Schaeffer et al., Schaeffer et al. also teaches a range (i.e., 4 – 20 percent) that has an endpoint within the applicant's claimed range, thereby anticipating such range. Please note that the teachings of a reference are not limited to its preferred embodiments.
6. Regarding Claims 12 – 13, the applicant argues that Schaeffer has no teaching of the temporal relation of the (bond coat) deposition and oxidation steps. In response, the examiner agrees that Schaeffer et al. does not explicitly teach the temporal relation of the deposition and oxidation steps. As such, Claims 12 – 13 were not rejected under 35 U.S.C. 102. However, the examiner maintains that the subject

matter of Claims 12 – 13 would have been obvious to one of ordinary skill in the art (see the discussion in paragraph 16 of the previous Office Action for details). Briefly, Schaeffer et al. teaches that the alumina scale (i.e., the layer produced by the oxidation of the bond coat) is formed "in situ", and the oxidation of the bond coat occurs before the deposition of the TBC (Col.3, lines 14 – 16, and Col.5, lines 12 – 15) but is silent regarding the specific time period before the deposition of the TBC that the bond coat is oxidized. However, under the constraint taught by Schaeffer et al. (i.e., that the oxidation of the bond coat occurs before the deposition of the TBC), there are only two possible time periods during which the bond coat could be oxidized – (1) during the deposition of the bond coat and before the deposition of the TBC, and (2) after the deposition of the bond coat and before the deposition of the TBC. Since the bond coat must be oxidized during at least one of these time periods in order to achieve the pre-oxidized bond coat desired by Schaeffer et al., it would have been obvious to one of ordinary skill in the art to oxidize the bond coat either concurrently with or after the deposition of the bond coat with the reasonable expectation of success and obtaining similar results (i.e., successfully oxidizing the bond coat to form an adherent alumina scale, regardless of whether the oxidation is done after the deposition or concurrently with the deposition). Both alternatives would be expected by one of ordinary skill in the art to have different advantages. For example, by performing the deposition and oxidation concurrently, a separate oxidation step would not be required, thereby advantageously reducing processing time; however, by performing the oxidation as a separate step after the deposition,

there would be less process variables to simultaneously regulate, thereby advantageously allowing the oxidation process to be more exactly and precisely controlled. This rejection is not based upon impermissible hindsight, as asserted by the applicant. It must be recognized that any judgment on obviousness is, in a sense, necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). It is worthy to note that the applicant claims both (1) depositing the bond coat and controllably oxidizing the bond coat concurrently and (2) controllably oxidizing the bond coat after depositing the bond coat, thereby essentially claiming oxidizing the bond coat at any possible time period. This is certainly not a non-obvious variation of the process taught by Schaeffer et al. in which the bond coat is oxidized at any time before the deposition of the TBC.

7. Regarding the 35 U.S.C. 103 rejection based on Duderstadt and Bruce, the applicant first argues that Duderstadt et al. explicitly teaches away from the claimed range by teaching that the ceramic topcoat is preferably zirconium oxide having from about 6 to 20 percent yttrium oxide (i.e., a value outside the claimed range). This is far from "teaching away" from the claimed range. Again, the examiner notes that the teachings of a reference are not limited to its preferred embodiments. Duderstadt et al. more broadly teaches that the preferred ceramic topcoat is zirconium oxide,

either without modification or with a small amount of a modifier added (Col.7, lines 1 – 7). This teaching clearly encompasses the applicant's claimed TBC and does not "teach away" from the claimed limitation. The applicant then argues that the combination of references relied upon by the examiner is purely a hindsight reconstruction of the present claims and there is no objective basis for combining the teachings of the references in the manner used by the examiner. In response, the examiner strongly disagrees. Please note that it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Additionally, Bruce et al. provides clear, unmistakable, and explicit motivation to combine the teachings of the references in the manner done so by the examiner. In detail, Bruce et al. teaches a TBC system to be utilized as a protective coating on gas turbine engine components (Abstract). The ceramic TBC layer is formed of YSZ having a columnar grain structure, the YSZ preferably containing about 2 to 5% by weight of yttria (Abstract). Importantly, Bruce et al. also teaches that, by using YSZ having a yttria content of less than 6% by weight, specifically about 2 to 5% by weight, the TBC system exhibits superior spallation resistance and adhesion when compared to conventional YSZ TBCs, such as 7%YSZ (Col.1, lines 5 – 11 and 63 – 66, Col.2, lines 39 – 50, Col.3, lines 37 – 50, and Col.4, lines 1 – 33

and 46 – 53). Therefore, it would have been obvious to one of ordinary skill in the art to deposit a YSZ TBC having a yttria content of about 2 to 5% by weight (i.e., a weight percent within the applicant's claimed range), as taught by Bruce et al., in the process of Duderstadt et al. as opposed to a YSZ TBC having a higher yttria content, such as about 6 to 20% by weight (as taught by Duderstadt et al.), with the reasonable expectation of successfully and advantageously producing a TBC on a gas turbine engine component that exhibits superior adhesion and spallation resistance, thereby increasing the life of the component. The applicant's argument that the only way to know which of these ranges (i.e., ranges of yttria content in the YSZ TBC) to choose in combining the teachings of the references is from the present disclosure is inaccurate. As set forth above, Bruce et al. clearly teaches the superiority of YSZ having a yttria content of less than 6% by weight, specifically about 2 to 5% by weight, over conventional YSZ TBCs having a higher yttria content, such as the YSZ TBC taught by Duderstadt et al. Therefore, the teachings of Bruce et al., not the present disclosure, show one of ordinary skill in the art which range of yttria content(s) to utilize in the TBC. The applicant's statement that, "Bruce et al. goes to great lengths to distinguish Duderstadt's approach of using more than 6 percent yttria..." may be correct. However, such a statement merely supports the examiner's finding of obviousness because, since Bruce et al. goes to great lengths to show why a TBC having a yttria content of about 2 to 5% by weight is superior to that of Duderstadt's, one of ordinary skill in the art would have been motivated to use

a superior YSZ TBC such as the one taught by Bruce et al. as opposed to the inferior TBC taught by Duderstadt.

8. Regarding Claims 10 – 11, the applicant argues that Duderstadt teaches away from the heating time period limitation (i.e., about ½ hour to about 3 hours) by teaching heating for a period of up to about 10 minutes. In response, the examiner maintains that a different teaching or teaching a different way is not equivalent to "teaching away" from a claimed limitation, at least not sufficiently so as to preclude a finding of obviousness. Additionally, the applicant's argument that one would go to higher temperatures to produce a thicker oxide layer so that a longer time would not be necessary is unconvincing. It is the examiner's position that one of ordinary skill in the art would be reasonably expected to perform the oxidation at higher temperatures, for longer times, or both in order to achieve a desired thicker oxide layer. The exact temperature and time would, of course, be dependent on the thickness of the oxide layer desired by the purveyor in the art.
9. Regarding the 35 U.S.C. 103 rejection based on Beele and Bruce, the applicant states that Beele teaches that the zirconia must be deposited on an anchoring layer that is a ternary oxide, and Bruce teaches that the YSZ must be deposited on an Al_2O_3 scale, which is a binary oxide. In response, the examiner has reviewed the cited portions of the Beele and Bruce documents, as well as the documents as a whole, and notes that no such teachings are present. Therefore, the applicant's argument is unconvincing. Briefly, Beele does not explicitly teach that the TBC is YSZ having a yttria content of from about 3% by weight to about 5% by weight of the

YSZ. However, Beele does teach that the oxide layer "2" (i.e., the TBC) should be made of a columnar grained oxide ceramic such as partially stabilized zirconia and can be deposited by PVD (Col.6, lines 19 – 24, and Col.7, lines 16 – 20). Bruce et al. teaches a TBC system to be utilized as a protective coating on gas turbine engine components (Abstract). The ceramic TBC layer is formed of YSZ having a columnar grain structure, the YSZ preferably containing about 2 to 5% by weight of yttria (Abstract). Importantly, Bruce et al. also teaches that, by using YSZ having a yttria content of less than 6% by weight, specifically about 2 to 5% by weight, the TBC system exhibits superior spallation resistance and adhesion when compared to conventional YSZ TBCs, such as 7%YSZ (Col.1, lines 5 – 11 and 63 – 66, Col.2, lines 39 – 50, Col.3, lines 37 – 50, and Col.4, lines 1 – 33 and 46 – 53). Therefore, it would have been obvious to one of ordinary skill in the art to deposit a YSZ TBC having a yttria content of about 2 to 5% by weight (i.e., a weight percent within the applicant's claimed range), as taught by Bruce et al., as the "partially stabilized zirconia" layer "2" in the process of Beele with the reasonable expectation of successfully and advantageously producing a TBC that exhibits superior adhesion and spallation resistance, thereby increasing the life of the coating / component. This combination of references in no way renders the prior art unsatisfactory for its intended purpose, as alleged by the applicant, and is not an impermissible hindsight reconstruction, as also alleged by the applicant. The motivation to combine the references is clearly present in the prior art (see the discussion above), not the instant application.

10. Regarding the double patenting rejections, the applicant broadly argues that there is no objective basis for combining the teachings of the pairs of references in each case. This argument is not convincing because there is an objective basis for combining the references in the manner done so by the examiner, and this basis is and has been clearly set forth (see paragraphs 29 and 31 of the previous Office Action).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (571) 272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Wesley D Markham
Examiner
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